Neue Lösungen der Kontinuitätsdifferentialgleichung mit Phasengleichgewicht zur Verbesserung der Ergebnisse bei der Auswertung von Experimenten, MathSEE

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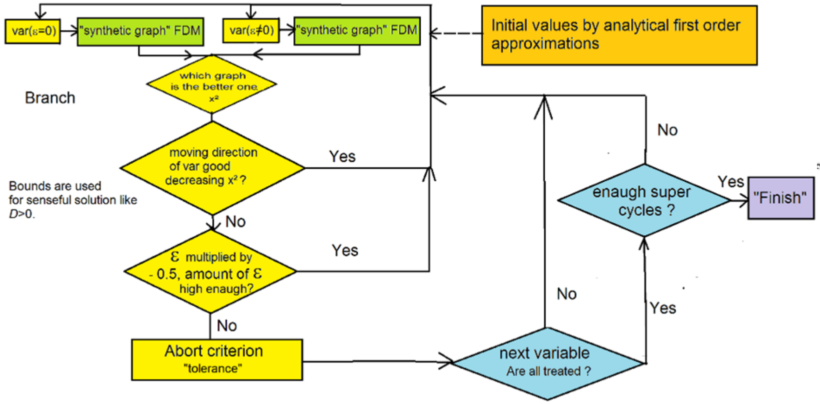
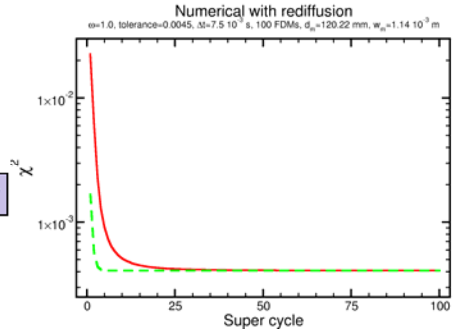
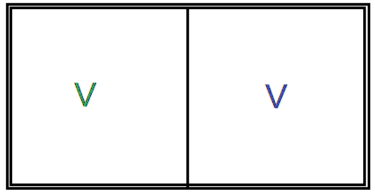
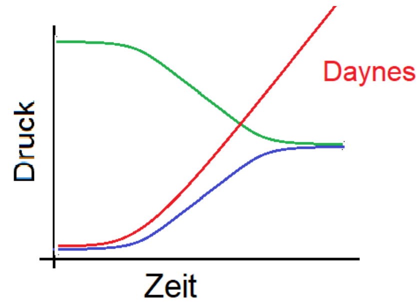
Bestimmung von Transportparametern aus gemessener Kurve mittels B&B branch and bound Algorithmus





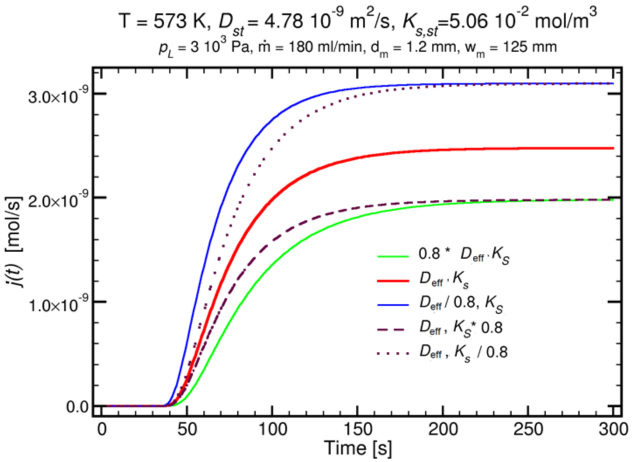


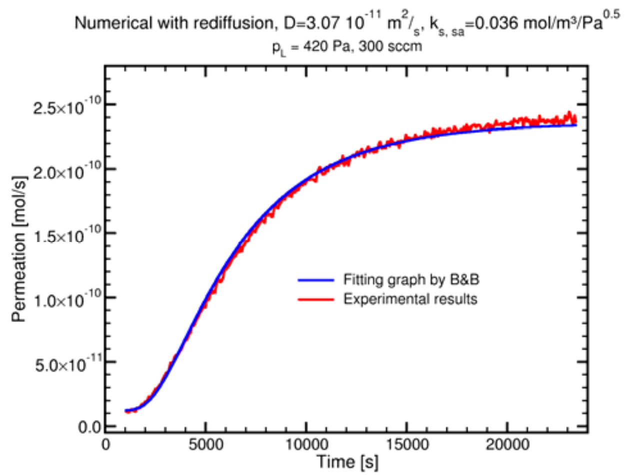


$$j(t)_{measure} = \underbrace{\frac{D_{eff}\,c(0)\,d_m^2}{w_m\,4\,\pi}}_{j_{steady\ state}}\left(1 + 2\sum_{k=1}^{\infty}(-1)^k e^{\frac{-k^2\pi^2 D_{eff}(t-t_{off})}{w_m^2}}\right)$$

Daynes Lösung bekannt, aber nicht anwendbar!

	super cycle	bounds
1.	$t_{off};\ t_{off} + \epsilon$	
2.	$D_{eff};\ D_{eff}\,(1+\varepsilon)$	$D_{eff} > 0$
3.	$c(0); c(0)(1+\epsilon)$	$c(0) > 0$
4.	$D_{eff}, c(0);\ \ D_{eff}\,(1 + \varepsilon)$, $c(0)/(1+\varepsilon)$	$j_{stedy\ state} = const.$
5.	$j_{offset};\ j_{offset}\,(1+\ \varepsilon)$	$j_{offset}\ > 0$





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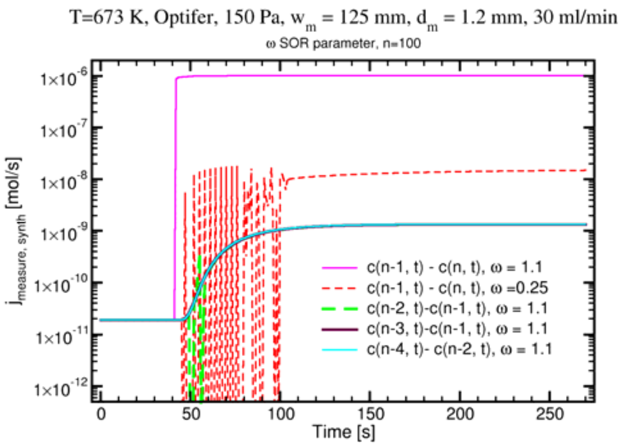
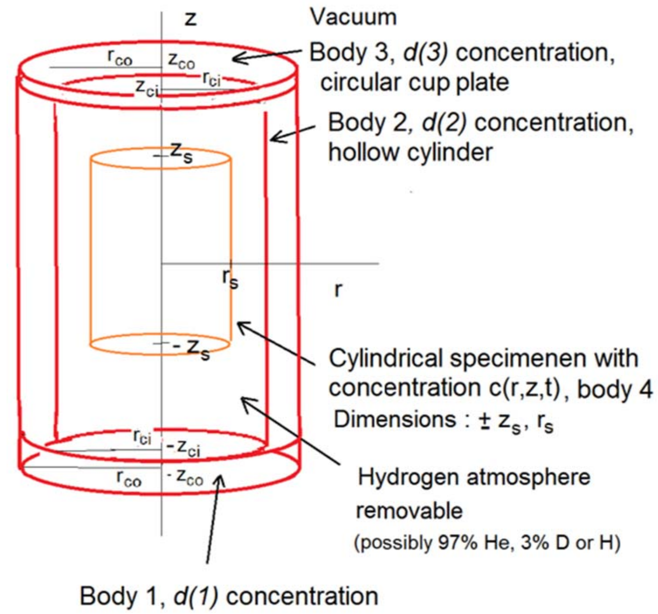


$$\vec{c}_{k+1} = \vec{c}_k + \begin{vmatrix} 0 & & & & & \\ D^* & -2D^* & D^* & & & \\ & D^* & -2D^* & D^* & & \\ & & D^* & -2D^* & D^* & \\ & & & \ddots & & \\ & & & D^* & -2D^* & D^* \\ & & & & & 0 \end{vmatrix} \vec{c}_{k+1} \qquad \vec{c}_{k+1} = \begin{vmatrix} 1 & & & & \\ -D^* & 1+2D^* & -D^* & & \\ & -D^* & 1+2D^* & -D^* & \\ & & -D^* & 1+2D^* & -D^* \\ & & & -D^* & 1+2D^* & -D^* \\ & & & \ddots & & \\ & & & -D^* & 1+2D^* & -D^* \\ & & & & & 1 \end{vmatrix}^{-1} \vec{c}_k$$

$$D^* = \frac{D\,\Delta t}{\Delta x^2}$$

$$\frac{\partial c}{\partial t} = D_{sa}\Delta c \qquad \frac{\partial d(i)}{\partial t} = D_{cu}\,\Delta d(i)\,,\, i = 1,2,3$$

$$\Delta = \frac{\partial^2}{\partial r^2} + \frac{1}{r}\frac{\partial}{\partial r} + \frac{\partial^2}{\partial z^2} + \underbrace{\frac{1}{r^2}\frac{\partial^2}{\partial \varphi^2}}_{=0}$$



Randbedingungen in Auswahl:

$$c(0 \le r \le r_s, z = \pm z_s, \forall t) = k_{s,sa}\sqrt{p(t)}$$

$$c(r = r_s, |z| \le z_s, \forall t) = k_{s,sa}\sqrt{p(t)} \qquad d(1)(r \le r_{co}, z = -z_{ci}, \forall t) = k_{s,cu}\sqrt{p(t)}$$

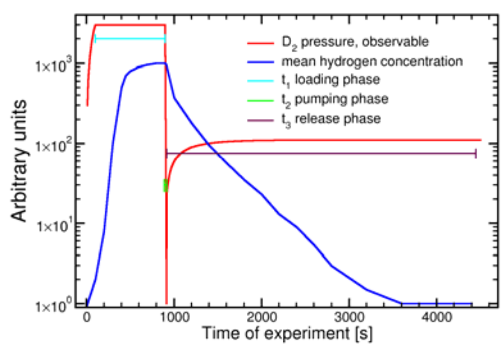
$$\frac{dm}{dt} = -2\,\pi\,D_{sa}\int_0^{r_s} \underbrace{2}_{symmetric} r\,\frac{\partial}{\partial z}\,c(r, z = z_s, t)\,dr - \underbrace{2\,\pi\,r_s D_{sa}\int_{-z_s}^{z_s}\frac{\partial}{\partial r}\,c(r = r_s, z, t)\,dz}_{superficies\ surface\ of\ specimen} -$$

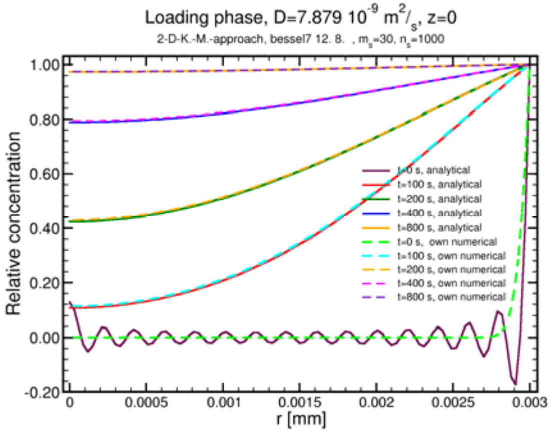
$$\underbrace{2\,\pi\,D_{cu}\int_0^{r_{co}} r\,\frac{\partial}{\partial z}\,d(1)(r, z = -z_{ci}, t)\,dr}_{circular\ aerea\ of\ body\ 1} - \underbrace{2\,\pi\,r_{ci}D_{cu}\int_{-z_{ci}}^{z_{ci}}\frac{\partial}{\partial r}\,d(2)(r = r_{ci}, z, t)\,dz}_{superficies\ surface\ of\ body\ 2} -$$

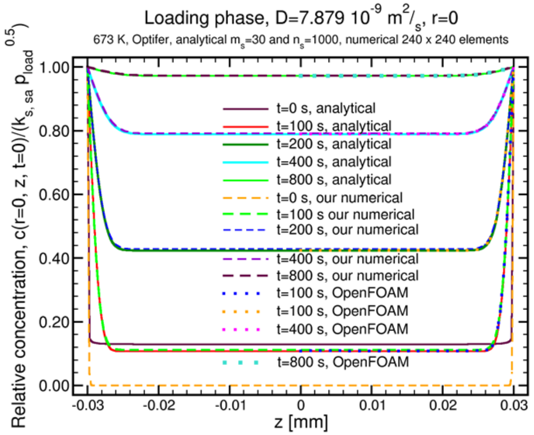
$$\underbrace{2\,\pi\,D_{cu}\int_0^{r_{co}} r\,\frac{\partial}{\partial z}\,d(3)(r, z = z_{ci}, t)\,dr}_{circular\ area\ of\ body3}$$

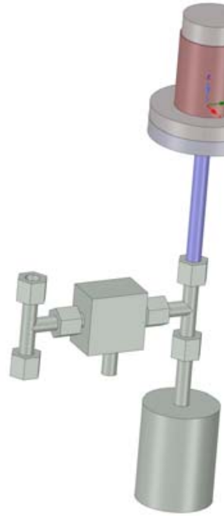
$$p(t) = p_{start} + \underbrace{k_v}_{RT_{abs}/V_{gas}}\int_{t_1+t_2}^{t}\underbrace{0.5}_{gaseous\leftrightarrow interstitial}\frac{dm}{dt}\,dt$$

Principle sketch of GR experimental flow









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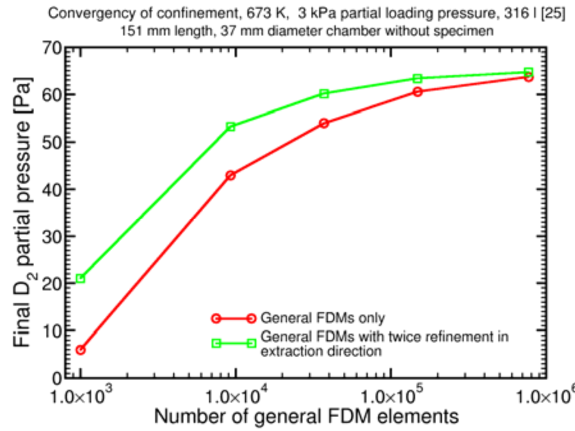

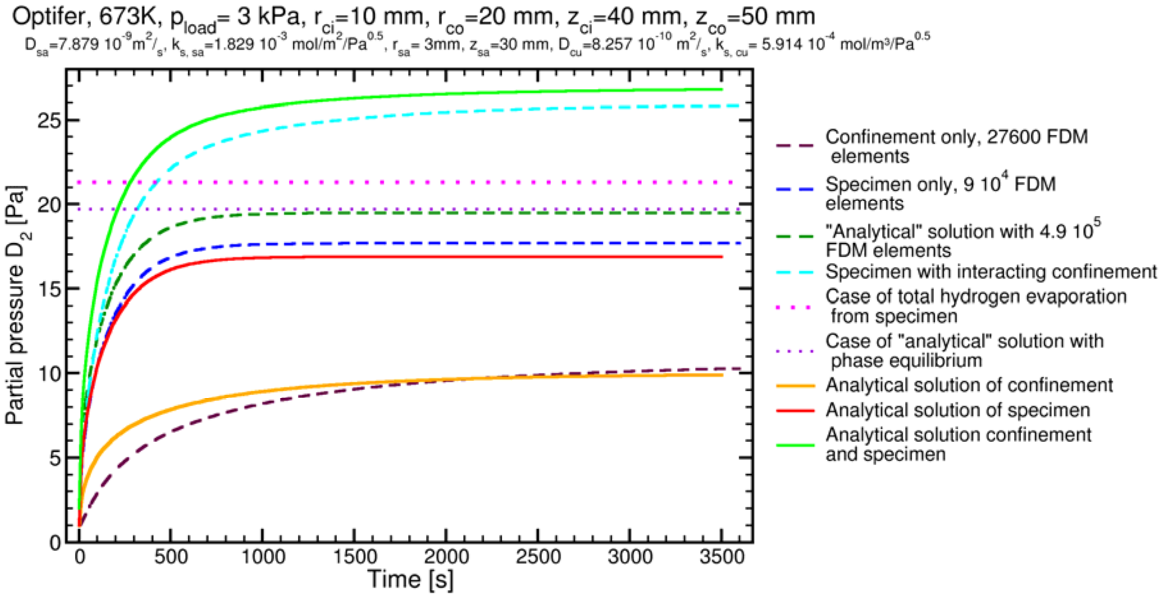

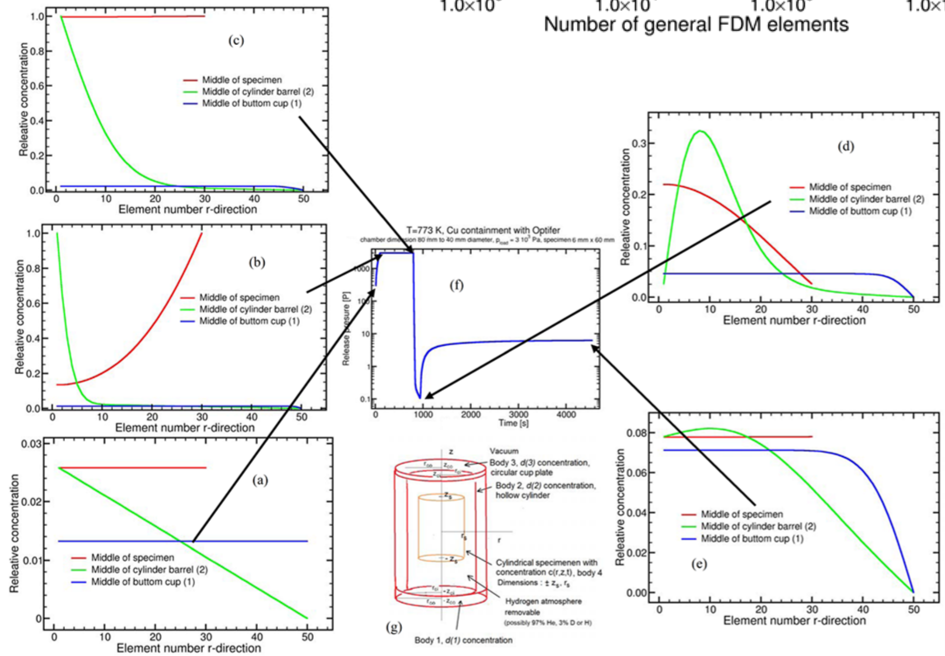

Acknowledgement:

The current talk summarizes results of two running projects:

Main goal of the first one is the determination of transport parameters of hydrogen in structural metallic materials used for components in fusion power stations:

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